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Morphotaxonomy of shallow water *Comanthus wahlbergii* (Müller, 1843) (Echinodermata: Crinoidea: Comasteridae) collected from Jiwani (Makran coast, Pakistan)

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ABSTRACT

Crinoidea is the class of marine animals composed of crinoids, which comprises the feather-stars or sea-lilies. Vast arrays of living and extinct species are found in shallow water to great depths in this most primitive of living classes of Echinodermata (Pandian, 2018). Many species of stalked crinoids live in deep seas and a few are sessile, which are exhibited on rocky beaches. There are a variety of colors, from the most vibrant animals to the pale or colorless. Only the genus *Comanthus* A.H.Clark, 1908 is found in Pakistani waters. Presently we described the taxonomy of shallow-water *Comanthus wahlbergii* (Müller, 1843) that were collected from Jiwani (Pakistan) (25°03'06"N 61°44'35"E).

Keywords: *Comanthus wahlbergii*, shallow water, feather stars, Jiwani (Makran coast, Pakistan).

1. INTRODUCTION

In the marine environment, echinoderms are among the most widespread and common animal groups (Hyman, 1955; Hickman et al., 2023). Additionally, they are clearly defined among animal phyla. The members of this group have basic pentamerous adults, a calcite skeleton and hydraulic tube feet connected to a water vascular system (Rowe and Gates, 1995; Hickman et al., 2023). There has been significant evolution within the phylum of echinoderms due to the unique characteristics of their skeletal systems (Lawrence, 1987; Hickman et al., 2023).

Echinoderms comprise animals usually known as feather star and sea lilies (Crinoidea); starfish (Asteroidea); brittle stars (Ophiuroidea); sea urchins, sand dollars and heart urchins (Echinoidea); and sea cucumbers (Holothuroidea). There are several commercial marine animals that work in marine ecosystems and have significant role in the overall ecology of the ocean as sediment recyclers,

scavengers, burrowers and predators (Hyman, 1955; Rowe and Gates, 1995; Putchakarn, 1998; Hickman et al., 2023). There are a variety of microhabitats for symbiotic fauna on crinoids, particularly polychaetes, myzostomids, shrimps and crabs, due to their complex external morphology (Sorokin, 1990; Fabricius and Dale, 1993; Deheyn et al., 2006; Britayev and Mekhova, 2011; Hickman et al., 2019).

Crinoids are considered to be a keystone group in tropical coral reefs because of their many symbiotic associations. Biodiversity studies of marine ecosystems tend to overlook and underestimate this symbiotic fauna. Crinoids filter plankton and tiny detritus particles out of flowing sea water with their feather-like arms. The arms are raised and confined vertical to the current to form a fan shape. The identification of crinoids is a difficult task. Patience and attention to skeletal details are necessary. The present study investigated the taxonomy of *Comanthus wahlbergii* collected from shallow water of Makran coast (Jiwani).

2. MATERIALS AND METHODS

Sixteen specimens were obtained all through low tide from intertidal zone of Jiwani (Makran coast, Pakistan) (Lat. 25°03'06"N Long. 61°44'35"E). For observation of crinoids were relaxed by spreading them in sea water, aqueous MgSO₄ (Epsom salt) was found to be the best narcotizing agent. The specimens were then spread out in a flat pan or a large dish with sea water, their arms not touching one another, MgSO₄ was sprinkled and fresh water was added gradually. The fully relaxed specimens were finally preserved in 70% alcohol. Length of arms 130 - 151mm. Radius of centrodorsal 4.0 - 6.0mm. Systematic was reviewed in according to WoRMS, (2023).

Systematic

Phylum Echinodermata Bruguière, 1791

Subphylum Crinozoa Matsumoto 1929

Class Crinoidea Miller, 1821

Subclass Articulata Zittel, 1879

Order Comatulida A. H. Clark, 1908

Superfamily Comatuloidea Fleming, 1828

Family Comatulidae Fleming, 1928

Subfamily Comatulinae Fleming, 1828

Genus *Comanthus* A.H. Clark, 1908

Species *Comanthus wahlbergii* (Müller, 1843)

***Comanthus wahlbergii* (Müller, 1843) (Figure 1, 2)**

Comanthus wahlbergii (Müller, 1843)

Alecto wahlbergii (Müller, 1843).

Comanthus samoana (Clark, 1912; Clark, 1913).

Comanthus (*Comanthus*) *samoana* (Clark, 1909).

Comanthus samoanus (Clark, 1909; Clark and Rowe, 1971).

Comanthus wahlbergi serratus (Clark, 1972).

Comanthus wahlbergi tenuibrachia (Clark, 1972) (Figure 1).

Comissia serrata (Gislén, 1938).

Comanthus walbergii (Clark, 1931; Clark, 1972; Rowe et al., 1986).



Figure 1 *Comanthus wahlbergii* (Müller, 1843)

3. RESULTS AND DESCRIPTION

The species has previously been reported from Jiwani by Hoque, (1969) as = *Comanthus samoanus*. The present specimens afford the first consequent record from this region. *Comanthus wahlbergii* (Figure 2A) is characterized by having 21 arms measuring 45.0mm in length and only 3.0mm diameter at the first syzygy. The centrodorsal is long compressed and discoidal it is 6.0mm in diameter and with one inclusive marginal row of XXIV-XXVI cirri.

All cirrus (Figure 2B) is stout, curved, jointed and well developed; arising from the centrodorsal measuring about 16.0mm in length and having up to 14 segments. The first 3 or 4 segments are small, the last 5 or 6 with dorsal crest. The penultimate segment bears stout, curved terminal claw. The brachial and pinnules are densely spinose. The proximal pinnules (Figure 2C) are exceedingly flexible with some of the terminal segments modified to form a comb. The combs occur at intervals extending up to the tips of the arms. The mouth is close to the edge of the disc. The anal tube is more or less central.

Color

Live specimens with dark brown aboral surface. Oral surface and cirri pale brown.

Ecology

An abundant, diurnal species found on boulders, incline surfaces and hard corals. A cirri is used to fix them to the surface. The arms of the filtration fan form a biplanar shape during feeding. Arrangement of pinnules in four planes. The tips of the inactive arms were pointing towards the calyx. Like environments with strong currents. Found at 3–5 m.

Distribution

Pacific Ocean, Pakistan, India, Sri Lanka, Red Sea, East Africa, South Africa, Madagascar, Seychelles, South-China Sea, Vietnam, Japan, north Australia, Great Barrier Reef, New Caledonia, New Zealand and Philippine.

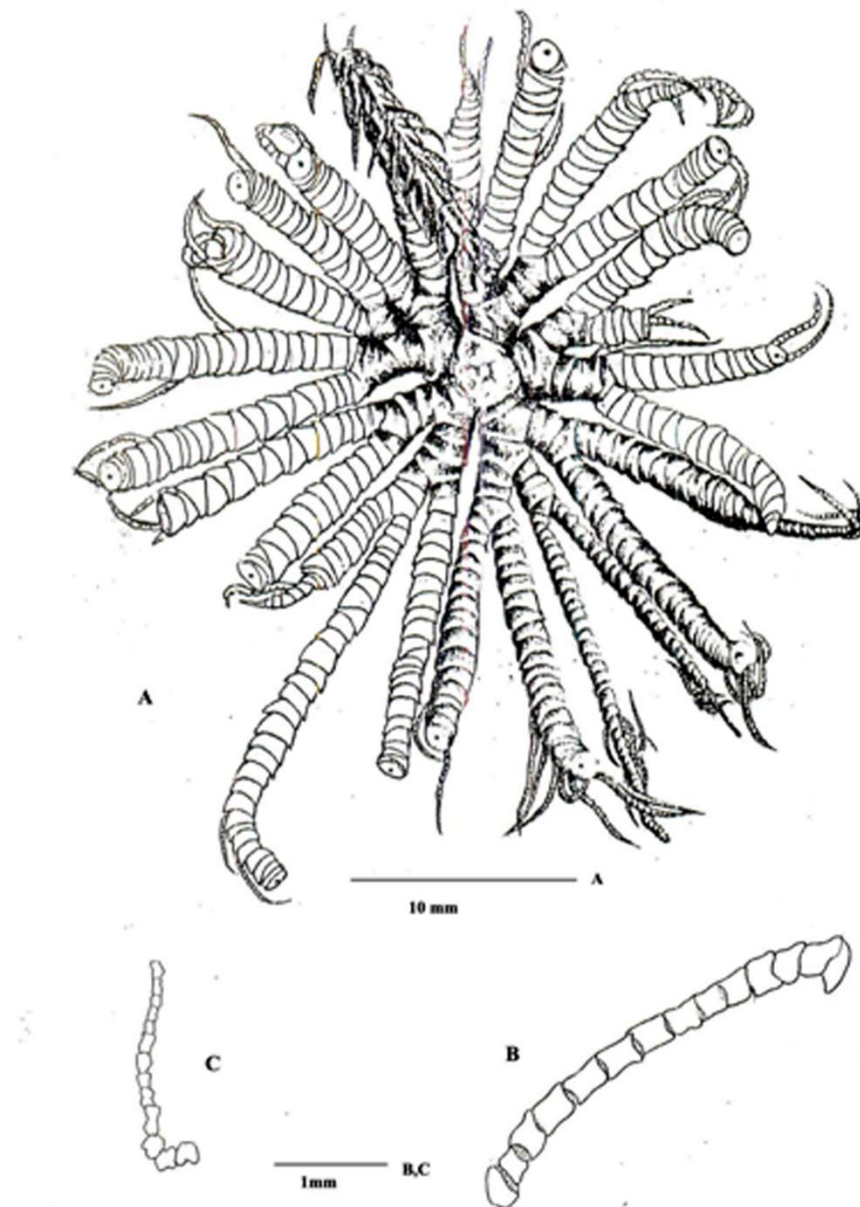


Figure 2 *Comanthus wahlbergii* (Müller, 1843). A) Entire specimen, dorsal view; B) Single cirrus; C) Single first pinnule

4. CONCLUDING REMARKS

There are more than 150 shallow-water species of unstalked crinoids in the Indian Ocean and western Pacific Ocean, with the greatest diversity (Messing, 1997). They may be able to avoid predators and find food since most of these organisms are not fixed to the substrate (Meyer and Macurda, 1977). Studies of crinoids' systematic, phylogenies and fauna have been conducted in great detail (Clark and Rowe, 1971; Rowe et al., 1986; Messing and White, 2001; Messing, 2003; Cohen et al., 2004). In spite of this, the fauna of a variety of areas of the World Ocean is poorly understood.

In particular, the fauna of the Palau Islands (Meyer and Macurda, 1980), Great Barrier Reef of Australia (Messing, 1994), Japan (Kogo, 1998; Kogo, 2006) and the Marshall Islands (Zmarzly, 1984; Zmarzly, 1985) are quite wholly investigated. Family comasteridae contains the subsequent eight genera reported from Indo-West Pacific region: *Capillaster*, *Comantheria*, *Comanthina*, *Comanthus*, *Comaster*, *Comatella*, *Comatula* and *Comissia* (Clark and Rowe, 1971). Only one genus *Comanthus* is found in Pakistan. There are only two recognized species of the genus *Comanthus*: *C. wahlbergii* (Müller, 1843) and *C. parvicirrus* Müller, 1841. Only *C. wahlbergii* is represented in our collection.

This species exhibits many of the adaptations and behaviors that have allowed it to exploit shallow marine habitats around the globe (Meyer and Macurda, 1977). They are capable to re-grow mainly of their organs after loss or damage, as well as arms and viscerae (Mozzi et al., 2006) and they have numerous morphological traits that minimize damage during predation trial (Oji and Okamoto, 1994). In

particular, feather stars, as well as *Comanthus wahlbergii*, typically branch the majority at the bottom of the rays (Oji and Okamoto, 1994). According to Baumiller and Gahn, (2013), this species loses an arm every 10 days. We lack long term observations of the crinoid populations. It is expected that further studies will expand the variety of crinoid species known in Pakistan's waters.

Table 1 Morphological differences between *C. wahlbergii* (Müller, 1843) and *C. parvicirrus* J.Müller, 1841

S. No.	<i>C. wahlbergii</i> (Müller, 1843)	<i>C. parvicirrus</i> J.Müller, 1841
1	Cirri are well developed, numerous (35–40) arranged in two rows on the edge of the Centro dorsal	Cirri very reduced in size and number, often infrequently set around the edge of the centrodorsal, distal segments only slightly shorter than the proximal ones
2	Less than 40 arms, usually about 20 or 21	Usually 19 – 42 arms
3	IIBr four, rarely two and IIIBr series four	IIBr and IIIBr series usually two

Disclosure statement

There is no financial support for this research work from the funding agency.

Informed consent

Not applicable.

Ethical approval

The ethical guidelines are followed in the study for species observation & identification.

Conflicts of interests

The authors declare that there are no conflicts of interests.

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Data and materials availability

All data associated with this study are present in the paper.

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